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ON TONALITY IN ENGLISH VERSE

In 1880 Sidney Lanier published a small volume entitled *The Science of English Verse.* In this work he called attention to the remarkably close relations that exist between music and verse, both when considered scientifically with reference to the laws of acoustics, and when considered with regard to the emotional appeal which each makes as an art.

His experiments and researches led him to conclude that quantity and accent are inherent in all verse, classic as well as modern, and to suggest as a means of expressing this fact, that, instead of the classic and the accentual methods of scansion, use be made of a system of notation similar to that employed in music. This under the head of "rhythms" occupies about five-sixths of the book. His arguments here are so convincing that only a few of the authorities on poetics now gainsay them.

The rest of the book treats of tune, or melody, and tone-color, or timbre, in verse. By misapplication of what Lanier gives in these closing chapters merely as suggestions on possible relations of music to verse, which he says he hopes to be able to establish at some future time (but which his death prevented), many queer notions have found their way into modern pedagogics. Some of these I wish to question; for, while music and verse are closely allied, there are many phenomena in verse which can not be explained by referring them to like instances in music. To endeavor to do so is a grave error.

Music and verse are the attempt of art to fulfill æsthetic desires of the ear. Music demands to be played; verse, to be recited. The musician who interprets his score without the aid of an instrument is only doing the same thing as the school-boy who cons his lesson without actually repeating the words. The eye perceives the symbol and in the symbol the brain hears the sound for which that symbol stands. Both arts are, then, dependent upon the ear for their interpretation and must, therefore, rest at their very foundation upon the same natural laws.

In order to make the conclusions, which I shall presently draw, clear to those of my readers who are unfamiliar with the physics of music, let us first consider briefly those fundamental laws of acoustics which must be comprehended, if the arguments by which I arrive at these conclusions are to be followed intelligently.

All sound is the result of matter in vibration. When the vibrations are irregular, they produce mere noise, but when they are continued and regular, they give forth a musical tone. Only musical tones need concern us here. Of these the human ear distinguishes three characteristics:

(1) Their pitch, that property[1] "of a sound or tone which depends upon the relative rapidity of the vibrations by which it is produced, a relatively acute or high pitch resulting from rapid vibrations and a relatively grave or low pitch from slow vibrations. It is estimated and stated in terms of vibration per second of the sounding body. It is experimentally determined either by direct comparison with a standard tuning-fork or by such instruments as the siren."

(2) Their intensity, that property of a sound or tone which depends primarily upon the amplitude of the vibrations of the sounding body, a relatively loud sound resulting from a broad swing, and a relatively soft sound from a contracted swing. There is no standard for determining the intensity of a sound, but the ear easily recognizes a comparative difference between a loud and a soft sound.

(3) Their tone-color or timbre, "that property by which we distinguish between the same tone as sounded upon two different musical instruments, as a piano and a violin."

Pitch and intensity are so generally understood as to need no further explanation. Tone-color, however, calls for a more careful consideration, as it is to an almost universal lack of knowledge concerning this phenomenon that so large a number of false conceptions as to the similarity of certain structural relations in verse to the structural relations of music has been allowed to pass unchallenged.

The simplest form of vibration is that of the tuning-fork. Here a metal bar, fastened at one end to a base, executes, when struck or bowed, a series of vibrations exactly similar to the oscillations of a pendulum. The tone emitted is soft and thin but very pure. The form of the vibrations of a piano string is quite different from that of the tuning-fork; for the piano string is fastened at both ends and in vibrating not only does it move from side to side, but, in addition, it also divides itself mathematically into sections of one half, one third, one fourth, one fifth, et cetera, the length of the entire string; and these sections, while vibrating with the entire string, at the same time vibrate just as though they were independent strings of a half, a third, a fourth, a fifth, et cetera, the length of the entire string, so that from the entire or unit string is given off a very prominent tone called the fundamental, while from each of the sections is heard a tone whose pitch is higher than that of the fundamental, a section one half of the unit string giving off a tone an octave higher than the fundamental; a section one third its length giving a tone an octave and a fifth higher than the fundamental; a section one fourth its length giving a tone two octaves higher than the fundamental, and so on. For instance, if the vibrating string has for its fundamental the note C, the sound which we hear consists predominantly of this C, but at the same time we hear, in various degrees of intensity for different instruments, the following series of harmonics or overtones, as these higher notes are called:

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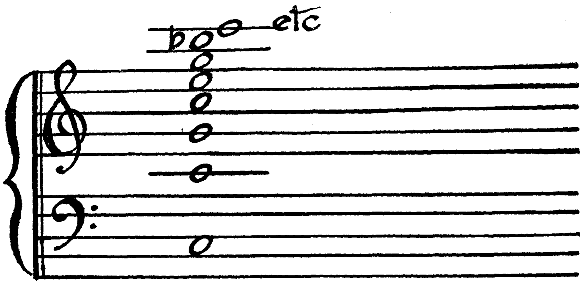
[1] All definitions are from *The Century Dictionary and Cyclopedia.*



the bottom note or fundamental being C, and the harmonics running c, g, c′, e′, g′, b′ flat, c″; the intervals between the harmonics becoming smaller and smaller as their number increases and their pitch gets higher. In the tone of the piano-forte only the harmonics given in the series above are heard; for its mechanical construction in such that the higher overtones are completely obscured. Even the sixth harmonic, while it is audible to very acute ears, is so faint, that, instead of the dominant seventh chord here written, the major triad is really heard. The octave, the third and the fifth of any fundamental are the most prominent harmonics of the piano-forte, though these vary in intensity among different makes. For the violin other sets of harmonics are present, according to the construction of the instrument and the method of attack employed by the performer. In all instruments the prominence of one set of overtones causes a corresponding weakening of all the others. It is to the presence of harmonics that the richness and individuality of tones are due; and, except when they are very high and close together, as in cymbals, the greater the number (but not the intensity) of the harmonics present, the more beautiful the tone.

Acute ears are able to detect the more prominent harmonics without mechanical aid, but, for the detection of the weaker ones, resonators must be used. These are metalic chambers so constructed that they respond to a definite pitch. For instance, take a resonator whose pitch is middle C of the piano-forte. Now, whenever a body which gives off the same number of vibrations per second as are required for this C, is made to vibrate, however faintly, the latter at once responds and the C is heard distinctly. With a series of resonators of the proper pitches, any tone may be analyzed, so that just what over-tones are present, and which of these are prominent, may be accurately determined.

In reed instruments such as the oboe and clarinet, the tone is produced either directly by the vibration of a reed in the mouthpiece, or indirectly by causing sympathetic vibrations of the column of air in the pipe. The power and quality of the tone depend largely upon the height and shape of the body of the pipe, which acts almost exclusively as a resonance chamber for the reinforcement of both the fundamental and its harmonics; for it must be remembered, that, as in the case of the piano and violin, the quality of the tone is due to the predominance of those harmonics which are strengthened by the mechanical structure of the instrument.

All that I have said thus far has served merely as the proper introduction for this important statement: The mechanism of the human voice, also, is essentially a reed instrument, the vocal cords being simply free membranous reeds which may be stretched within the larynx.

Although the human organs of speech are essentially similar in mechanism to the parts of a reed instrument, they are, by far, more intricate and delicate in their structure than the most complex of single voiced instruments. Across the centre of the small, three-cornered box of cartilages, which serves as the mouthpiece of this instrument, are stretched two bands of membrane whose edges fit together with such exactness that they completely close the cavity of the larynx without impinging a hair's breadth upon each other. In making a sound, air from the lungs is directed against these bands, called the vocal cords. This causes them to vibrate in such a manner that they draw apart and then come together again, alternately permitting the passage of the air and preventing it. The rate of the vibrations is controlled by reflex action in the mind of the speaker, or singer, according to the pitch which he wishes to produce. So wonderfully delicate is the action of the vocal cords, that they can even change their thickness instantaneously in order to facilitate or to retard their vibrations. The rate of the vibrations of the vocal cords fixes the pitch of the sound; the size and shape assumed by the nasal and buccal cavities determine its quality, or tone-color, by affording the necessary reinforcement for those harmonics which produce the effects desired.

The first great physicist to experiment upon the structure of vowel sounds with a degree of accuracy approaching that of the modern investigator, was Helmholz. For years he was the sole authority on this subject, but more recent work by Louis Bevier, Jr., has extended the scope of our knowledge considerably beyond what Helmholz thought to be true. Even Bevier's experiments, however, are not conclusive as to which harmonics are prominent for a given vowel, and at what pitches these receive their greatest reinforcement from the cavity of the mouth:

yet upon one fundamental fact all physicists agree, the differences of vowel-color are due to the prominence of different sets of harmonics.

In the vowel sounds which he examined, Helmholz found, for the most part, that there was but a single over-tone present (in several instances he did find two), and that this over-tone must fall within narrow limits if it was to receive reinforcement from the resonator of unchanging pitch which he thought was formed by the shape which the cavity of the mouth assumed in the production of each vowel sound. It is now known that the buccal cavity, while retaining the same general shape, can so alter itself as to reinforce the harmonics necessary for the characterization of a given vowel sound, while the fundamental upon which it is sung varies its pitch through a comparatively wide range. Of course, there are pitches of maximum resonance for each vowel sound, but the mathematical curves representing the fluctuations below this maximum are far more regular than they were formerly supposed to be.

In speaking, the voice makes use of so small a part of its actual range that all shades of vowel-color may be clearly enunciated by the normal voice. In singing, the matter becomes far more complicated, for reasons that I shall presently give.

Now that we have before us a general outline of the mechanism of the voice, it is time to go somewhat into particulars and to discuss briefly the over-tones that characterize several of the most distinctive vowel sounds.

First, however, let me state that the reason why consonants do not need discussion here is, that, according to Helmholz, they are not musical sounds, but noises. Vowels, on the contrary, are musical sounds; for the vibrations required to produce them are both continued and regular.

For the production of the vowel U (as in *sue*), the mouth is given the shape of a resonator with a large belly and a narrow mouth. Its maximum resonance must, consequently be low (Helmholz places it at middle F of the base clef). In this vowel the fundamental is very strong; the third harmonic, pronounced. In the singing voice it is only from a low fundamental that a well-defined U can be secured. However, much of the difficulty met with in characterizing U may be due to the lips being so closely pressed together as to prevent the free emission of the tone.

O (as in *go*) and Ä (as in *fär*) are most easily enunciated of all vowels; because the lips and teeth are well apart and the entire buccal cavity is uniformly open, thus allowing the sound to pass unrestricted from the vocal cords through the resonator into the air. In Ä the second harmonic is neglected; the third, feeble; the fifth and seventh, very strong; while in O, it is the second harmonic which is strong; the third and fourth, weak.

I (as in *die*) and E (as in *see*) are pronounced by a greater expansion in the rear of the cavity of the mouth than in front — the lips are well back; the teeth, close together. In this position of the mouth, the sound finds its greatest resonance in the back of the cavity and it is somewhat muffled by the time that it has been more closely confined at the front of the mouth and then forced through the narrow opening between the teeth. The difficulty in making these vowels clear is, however, primarily to be accounted for from the fact that their over-tones lie so high, that, if the fundamental upon which they are sung be above a moderate pitch, the over-tones pass into that region of the scale where the ear is no longer able to distinguish any difference between their pitches. The sound of the vowel is, in consequence, blurred.

It has recently been asserted that there is a variation in pitch for every vowel sound, and this is referred to in poetics as *pitch*, the authors saying distinctly that *pitch* is to be understood as having the same meaning as that connoted by *pitch* in music. This, I think, is a misnomer; for, as we have seen, no vowel has any definite number of vibrations per second that are required to produce it, although beyond certain limits in pitch, most vowels are characterized with difficulty. I insist that this is not because U, O, Ä are pitched low, while I and E are pitched high. I and E, as well as U, are clearest when their fundamentals are low. The reasons I have already given. The harmonics for I and E are certainly higher than those for U, but that is no more reason for saying that the pitch of I and E is higher than that of U than there is in calling the tone of the cornet high and that of the piano low, because the harmonics of the latter are lower than those of the former. If this is true, should not the terms *pitch* and *high and low vowels* be eliminated from the vocabulary of poetics?

Since there is no correct use of *pitch* when applied to verse where the meaning is that which was assigned to it in the opening sentence of the preceding paragraph, there can be in verse no such relation of the various pitches to one another as is indicated by the use of *key* in its musical sense; for *key*, in musical theory and notation, is "the tonality centering in a given tone, or the several tones taken collectively, of a given scale, major or minor." It is a peculiarity of keys that each key is best adapted to express a certain emotion. Gay moods demand A-major; F-major suits a tender pensiveness; D-minor is intensely tragic. Other keys can be employed to produce these effects, but those mentioned produce them most naturally, just as certain instruments are peculiarly adapted to express certain emotions. Imagine *The Death of Asoe*, played on a flute. In this respect there certainly is much similarity between music and verse:— certain vowels cause the emotions to respond more readily to a solemn thought than does another set of vowels combined so as to mean the same thing. If a sombre picture is to be produced, fill the lines with ÖÖ's, Ö's and Ä's: the result will be far more impressive than if synonyms containing E's and I's were substituted for them. This resemblance, however, is far closer to the effects obtained from the individual instruments which compose the orchestra than it is to the effects due to the actual key in which these instruments may be playing. But *key* cannot be so restricted in meaning as to cause it to present this relation alone. If, however, *key* must be used, we should say that a poem is in a major or a minor key, keeping in mind all the while, that any key extends from the highest to the lowest tone which musical instruments are capable of producing, and that in using *major* and *minor* you do not mean that the vowels are following one another in any such sequence of pitches as would be employed by the tones of the musical scale. The manner in which both appeal to the emotions is the only ground upon which their resemblance can rightly be based; in each instance, this is effected by *tone-color*. Musicians constantly speak of the "tone-color of keys" as well as of "the tone-color of instruments." Now since it is in tone-color alone that verse has any relation to key, both *key* and *pitch*, so called, when referring to vowel sounds in verse, should properly be included in the single term *vowel-color*.

There is absolutely no relation of sounds in verse that can be compared to harmony in music; for harmony is the agreement in sound of two or more tones vibrating simultaneously, as in chords. Harmony demands just those relations of sounds in pitch and key which verse does not possess. Moreover, in verse no two sounds are ever produced simultaneously. Rhyme has only one faint resemblance to harmony — the rhyming syllables do sometimes chance to fall under one another. Verse does possess *harmony* in that it pleases the ear, but this is not the *harmony* of music.

Tune or melody in speech is a far more subtle thing than tune in music, but it must be understood in the very beginning that tune in speech is no more dependent on the combination of vowels and consonants than is tune in vocal music. In music, tune is the result of rhythmic successions of different pitches. Tune in speech, unless that speech be verse, need not be rhythmic. It is imperative, however, that the pitch vary. Lanier makes this so plain in Chapter X, of his *Science of English Verse* that I need only call attention to one fact:— tune is as important a factor in prose as in verse. A word may be spoken to a thousand different tunes, if there are that many ideas to be expressed by it, the tune depending solely on the sense to be conveyed. The voice in making these distinctions uses shades of pitch, intensity and color that no instrument is capable of reproducing. The violin can imitate the shades of pitch with wonderful exactness, but they are far too delicate ever to be written down, and even when recorded could never be reproduced; for it would be impossible to repeat such infinitesimal shades of sound with any degree of accuracy.

While I am fond of thinking of each vowel sound as the peculiar tone of a reed instrument, within whose limited compass the intensity of the tone depends upon the amount of reinforcement received from a resonator capable of altering its pitch, and of all the vowel sounds as composing the wonderfully rich orchestra of the human voice, I am afraid that by saying so here I am helping to establish the precedent of setting the fancy free that has already led to so much misunderstanding; hence, let me close with the statement of dry fact:

(1) Aside from rhythm, differences between poetry and music are so numerous and so marked as to render the employment of musical terms in poetics unadvisable.

(2) Verse is no nearer music than painting is to sculpture, although verse and music are alike dependent for their existence upon the same phenomena of acoustics.

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